PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
000677-0036		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/CA 03/01496	29.09.2003	27.09.2002
International Patent Classification (IPC) or both national classification and IPC		
B01D53/62		
Applicant		
C02 SOLUTION INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23.02.2004	30.12.2004
Name and mailing address of the international preliminary examining authority:	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	de Biasio, A Telephone No. +49 89 2399-8627

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/CA 03/01496

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-12 as originally filed

Claims, Numbers

1-22 as originally filed

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2-22
	No:	Claims	1
Inventive step (IS)	Yes:	Claims	-
	No:	Claims	1-22
Industrial applicability (IA)	Yes:	Claims	1-22
	No:	Claims	-

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. WO-A-96/40414 (D1) discloses a process for recycling carbon dioxide emissions from a fossil-fuel power plant (cf p. 19, ll.1-4) into carbonated species (page 9, ll. 2-5; example 2), comprising the steps of:

   a) combustion of a fossil fuel, thereby generating heat and a hot exhaust gas containing CO_2 (cf page 15, ll. 1-5);
   b) converting said heat into energy (cf page 15, ll. 1-5);
   c) cooling said exhaust gas (page 9, ll. 14-17); and
   d) reducing the amount of CO_2 contained in the cooled exhaust gas by biologically transforming said CO_2 into carbonated species; thereby obtaining a low CO_2 exhaust gas (example 2).

   All features of claim 1 appear to be known from D1, thus the subject-matter of claim 1 lacks novelty (Art. 33(2) PCT).

2. Dependent claims 14 do not seem to include additional technical features rendering their subject-matter inventive (Art. 33(3) PCT) over the disclosure of D1.

   Cls. 2-4: A.m. step d) is performed in D1 with carbonic anhydrase. Moreover, the separation of carbonates from an aqueous solution by precipitation is well known in the field of treating flue gases from fossil-fuel power plants (cf US-A-6.187.277 (D2), col. 9, ll. 35-43).

   Cl. 5: In claim 20 of D1, water is said to be present as a condensed phase in the reactor.

   Cl. 6: In claim 19 of D1, the enzyme is immobilized on the surface of beads.

   Cls. 7,8: In claim 2 of D1, the enzyme is said to be "solvated", i.e. it seems to be in suspension in a liquid phase. In claim 9 of D1, dependent on claim 2, the enzyme is immobilized at the surface of beads floating on the surface of a fluid phase

   Cl. 9: cf. D2, page 9, ll. 8-17.

   Cl. 10,11: cf. D2, page 9, ll. 10-15.

Cl. 12,13: cf. D2, col. 9, ll. 35-43.

Cl. 14: To cool an exhaust gas with a heat exchanger should be trivial and to recycle the removed heat in the a.m. energy conversion process can be considered as a measure a skilled person would consider without exercising any inventiveness.

3. The device of claim 15, if compared to the method of claim 1 further comprises precipitation means suitable for precipitating carbonated species, i.e. it corresponds to the method of claim 2. The precipitating means being defined in a very broad way, the objection of lack of inventive step raised against the method of claim 2 applies also to the subject-matter of claim 15 (Art. 33(3) PCT.

4. The remarks made under item 2. seem to apply also to the additional technical features of dependent claims 16-22. The latter do thus not seem to involve an inventive step (Art. 33(3) PCT).

   As far as claim 18 of the present application is concerned, the applicants' attention is drawn to figure 1 of D1.

5. WO-A-98/55210 (D3), cited in the application, describes a bioreactor with carbonic anhydrase to effect the hydration of CO_2 into bicarbonate. The problem of global warming is also mentioned therein, i.e. to apply the method of D3 to flue gases should be obvious. The subject-matter of claim 1 does not appear to be inventive over D3.

Further Remarks:

1. As already mentioned under item V.3., the device of independent claim 15 does not correspond to the method of independent claim 1, as it further includes a precipitation unit. Said precipitation unit should be considered as essential for the device of the present application, but only optional for the method of the present application. Consequently, there seems to be a contradiction as far as essential features as concerned (Art. 6 PCT).

2. In claim 15 biological means for transforming CO_2 into hydrogen ions and carbonate ions are mentioned. It is, however, unclear where these hydrogen ions should come from (Art. 6 PCT). In order to obtain hydrogen ions from CO_2, other chemical species

comprising H-atoms should be involved. Claim 1 only mentions the formation of carbonate species. There is again a contradiction between claim 1 and claim 15 regarding the essential features.